

What is claimed is:

1. An optical filter, comprising:

5 first, second, and third Mach-Zehnder
interferometers;

first and second optical path change units
changing an optical path of said first and second Mach-
Zehnder interferometers; and

10 a control unit controlling a filter extinction
ratio of the optical filter using a first optical path
change unit and a second optical path change unit,
wherein

15 said control unit sets an amount of a change in
an optical path of said first optical path change unit
and an amount of a change in an optical path of said
second optical path change unit such that a filter
average insertion loss of the optical filter, a filter
extinction ratio, and amounts of changes in an optical
path of said first and second optical path change units
20 can satisfy a predetermined relationship.

2. The optical filter according to claim 1, wherein:

a first equation indicating the predetermined
relationship is obtained by simultaneously solving:

25 a third equation indicating the relationship

between a filter average insertion loss obtained by a second equation indicating output intensity of signal light at a waveguide terminal and an amount of a change in an optical path by said first and second optical 5 path change units and

a fourth equation indicating the relationship between a filter extinction ratio obtained by the second equation and the amount of a change in optical path by said first and second optical path change units.

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3. The optical filter according to claim 1, wherein said control device sets the amount of a change in an optical path by said first and second optical path change units such that the filter average 15 insertion loss can be changed with the filter extinction ratio of the optical filter maintained at a predetermined value based on the relationship.

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4. The optical filter according to claim 1, wherein said control device sets the amount of a change in an optical path by said first and second optical path change units such that the filter extinction ratio can be changed with the filter average insertion loss of the optical filter maintained at a predetermined 25 value based on the relationship.

5. The optical filter according to claim 1, wherein
said control device independently controls the
filter extinction ratio of the optical filter and the
5 filter average insertion loss by setting the amount of
a change in an optical path by said first and second
optical path change units based on the relationship.
10. The optical filter according to claim 1, wherein
said first and second optical path change units
can change the optical path using a thermo-optical
effect.
15. The optical filter according to claim 1, wherein
said first and second optical path change units
change the optical path using an electro-optical effect.
20. The optical filter according to claim 1, wherein
said optical filter is used in an optical gain
equalizer.
25. A control device which controls an optical filter,
wherein:
the optical filter comprises
first, second, and third Mach-Zehnder

interferometers; and

 said control device independently and individually sets amounts of changes in an optical path by first and second optical path change units.

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10. An optical gain equalizer configured by coupling a plurality of optical filters, wherein

each optical filter comprises:

 first, second, and third Mach-Zehnder

10 interferometers; and

 first and second optical path change units individually changing an optical path of said first and second Mach-Zehnder interferometers to control a filter extinction ratio of the optical filter.

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11. The optical gain equalizer according to claim 10, wherein

 said optical gain equalizer is provided at a stage subsequent to an optical amplifier provided in a 20 middle of relay spans of an optical transmission system.

12. An optical amplifier, comprising:

 a first optical amplification unit;

25 a second optical amplification unit provided at a stage subsequent to said first optical amplification

unit;

an optical signal monitor unit monitoring an output power level of signal light output from said second optical amplification unit; and

5 an optical gain equalizer which is configured by coupling a plurality of Mach-Zehnder interferometer type optical filters, and to which a monitor result of the output power level is fed back, wherein:

10 each Mach-Zehnder interferometer type optical filter comprises:

first, second, and third Mach-Zehnder interferometers; and

15 first and second optical path change units individually changing an optical path of said first and second Mach-Zehnder interferometers to control a filter extinction ratio of the optical filter; and

20 average insertion loss of said optical gain equalizer is controlled using first and second optical path change units of each Mach-Zehnder interferometer type optical filter so that the output power level of the signal light can be evened.

13. The optical amplifier according to claim 12, wherein

25 said optical gain equalizer is provided between

said first and optical amplification units.

14. The optical amplifier according to claim 12,
wherein

5 said optical gain equalizer is provided in a
stage preceding said first optical amplification unit.

15. The optical amplifier according to claim 12,
wherein

10 said optical gain equalizer is provided between
said second optical amplification unit and said optical
signal monitor unit.

16. The optical amplifier according to claim 12,
15 further comprising:

an optical branch unit for performing automatic
gain control on each optical amplification unit and a
photodiode at stages respectively preceding and
subsequent to each optical amplification unit.

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17. The optical amplifier according to claim 12,
further comprising:

25 an optical branch unit for performing automatic
output control on each optical amplification unit and a
photodiode at stages subsequent to each optical

amplification unit.

18. The optical amplifier according to claim 12,
wherein

5 said optical amplifier is provided in a middle of
relay spans of an optical transmission system.

19. An optical filter control method wherein:
the optical filter comprises:

10 serially connected first, second, and third
Mach-Zehnder interferometers; and
 first and second optical path change units
changing an optical path of said first and second Mach-
Zehnder interferometers to control a filter extinction
15 ratio of the optical filter; and

 an amount of a change in optical path of said
first optical path change unit and an amount of a
change in an optical path of said second optical path
change unit are set such that a filter average
20 insertion loss of the optical filter, a filter
extinction ratio, and amounts of changes in an optical
path of said first and second optical path change units
can satisfy a predetermined relationship.